



# Structural reforms during the Greek economic adjustment programme

The amalgamation of municipalities

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# Introduction



# Introduction

- In the last 50 years, municipalities across Europe have faced different economic and government budget challenges that put pressure on their performance in terms of efficiency, effectiveness, and quality of public services.
  1. An **increase in the demand for the provision of (specialized) public goods** coupled together with a greater accountability and transparency
  2. The **fulfilment of the EU requirements for fiscal discipline on public finance**, imposed by central governments to local governments, has led municipalities to reduce their expenditures
- To deal with these issues, central governments have been experimenting with institutional tools, such as **amalgamation of municipalities and intermunicipal cooperation**.



# Aim and objective

- Shed fresh light to this debate by investigating the municipal amalgamation in Greece, that took place in 2010.
  - As part of the economic adjustment programme of the country, this reform aimed to improve the public financial management and administration of local governments.
- We focus on the **amalgamation effect on current costs and investments**, before and after the merger.

## Objective:

1. Identify the **impact** of the amalgamation process
2. Control for the various **potential sources of biases** due to heterogeneity



# Relevant Literature

**Amalgamated municipalities →  
lower per capita expenditure**

**e.g.** after amalgamation relative to  
non-amalgamated ones

Israel (Reingewertz, 2012)

Germany (Blesse and Baskaran,  
2016)

Sweden (Hanes, 2015)

**Municipalities' spending →  
higher in merged municipalities**

**e.g.**

Finland (Moisio and Uusitalo, 2013)

Germany (Roesel, 2017)

The Netherlands (Allers and  
Geertsema, 2016)

Brazil (Lima and Silveira Neto, 2018))



# Findings

1. Significant effects on current costs only when we control for region-by-year fixed effects as well as vertical transfers.
2. Negative and robust effect of amalgamation on investment, as the amalgamation process led to a decrease in the (log of) per capita investment in the range of 11 to 20%.
3. Statistically significant decrease in local GDP; The reduction in investment has been achieved by significantly deteriorating local economic conditions.

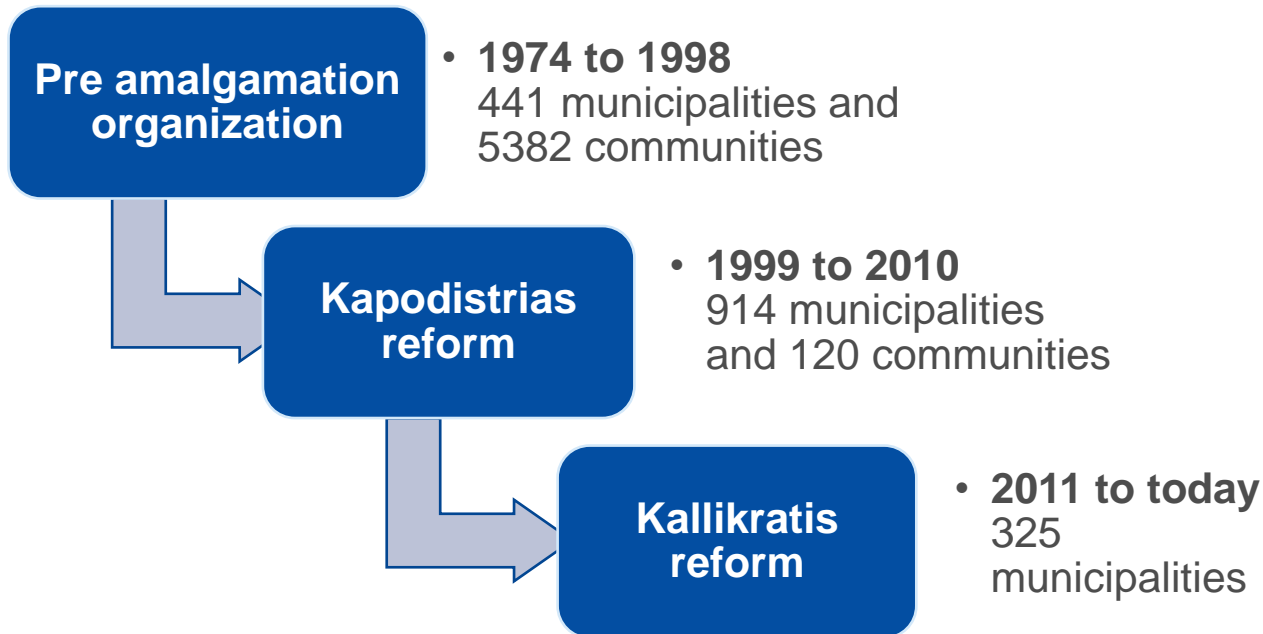


# Institutional framework

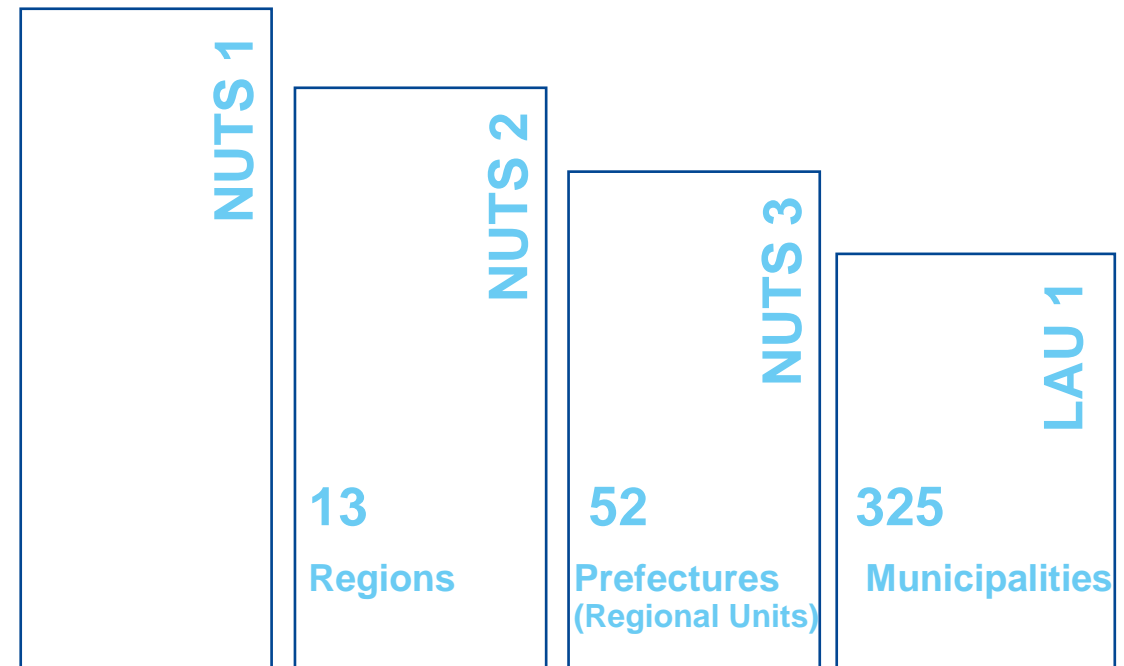


# Administrative structure

## History of local administrative structure in Greece



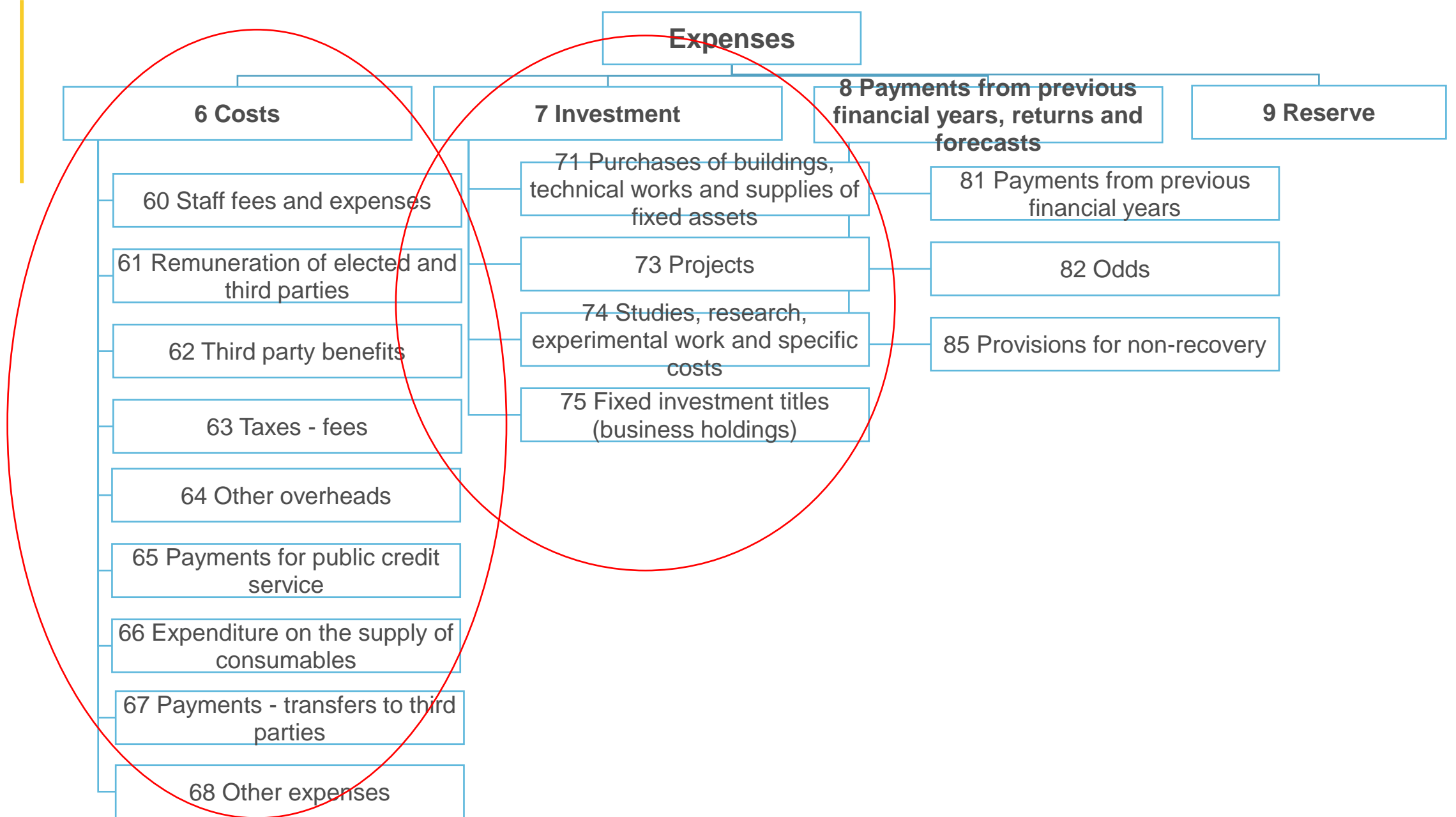
## Current NUTS classification in Greece





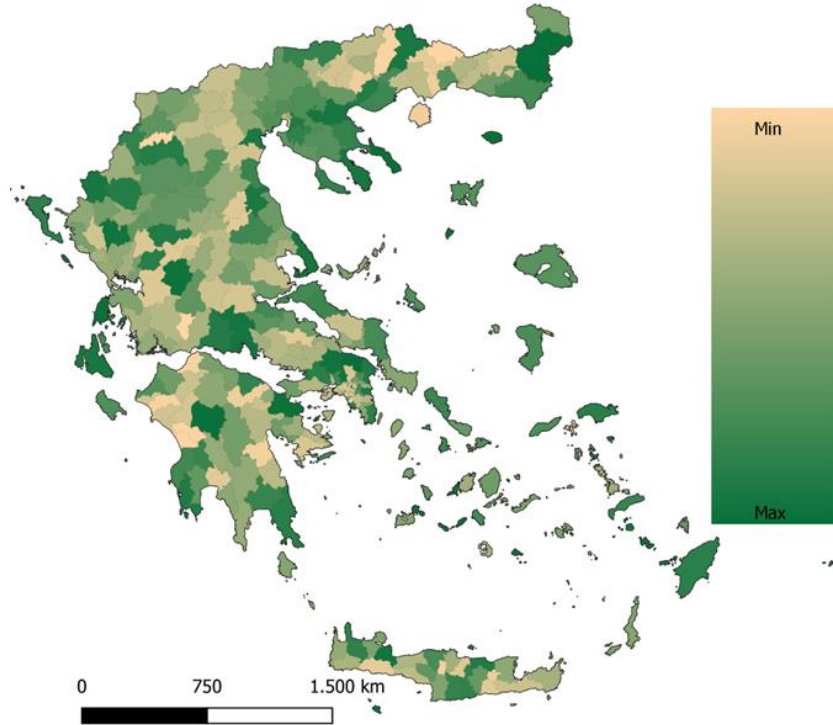
# Data



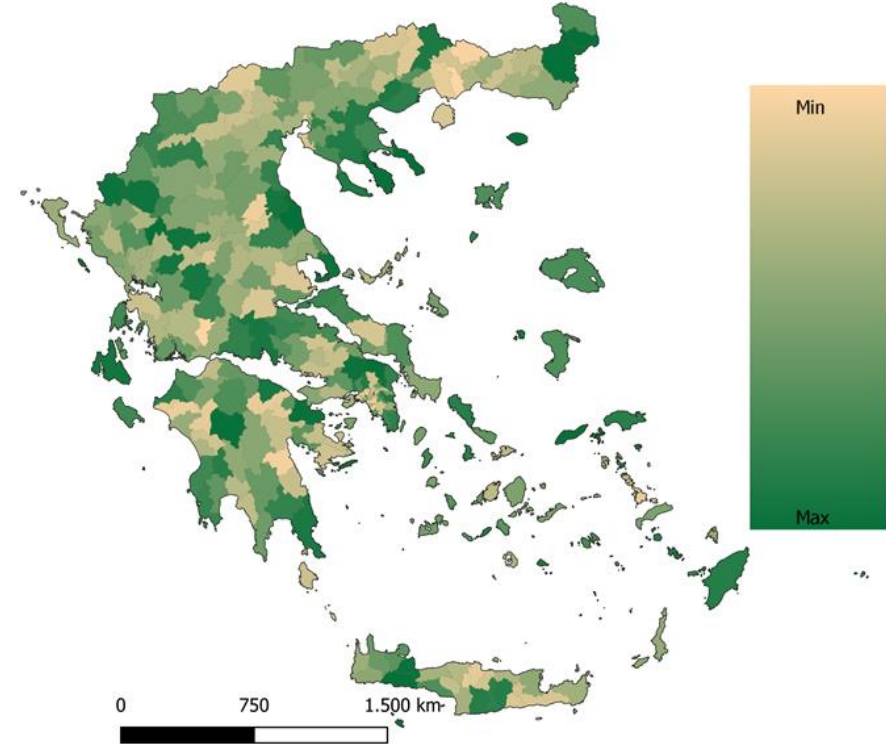


# Average Current Costs before and after the amalgamation process

Average Current Costs per capita before the amalgamation (2005-2009)



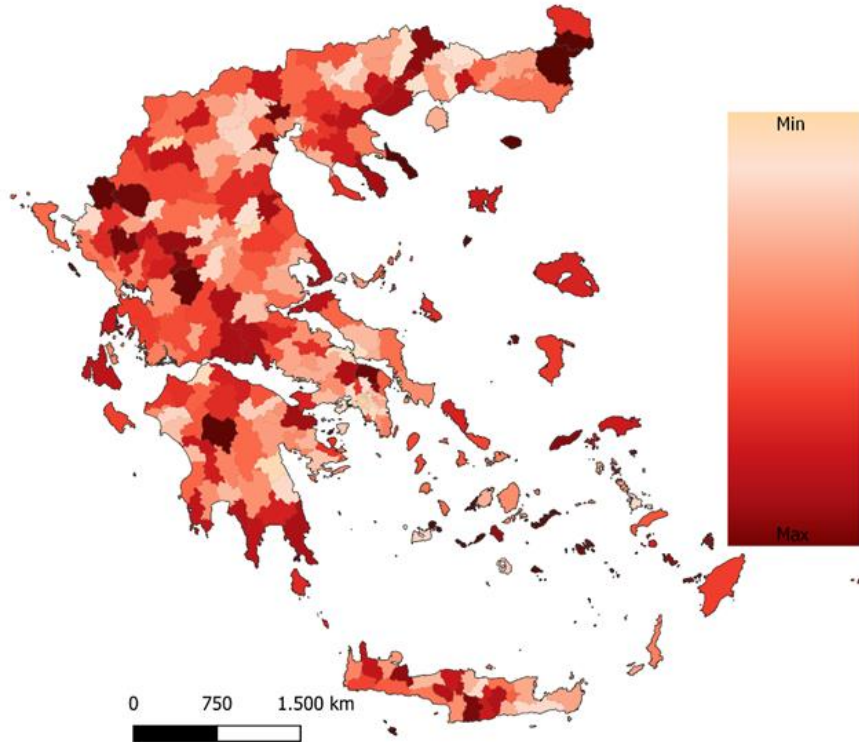
Average Current Costs per capita after the amalgamation (2011-2018)



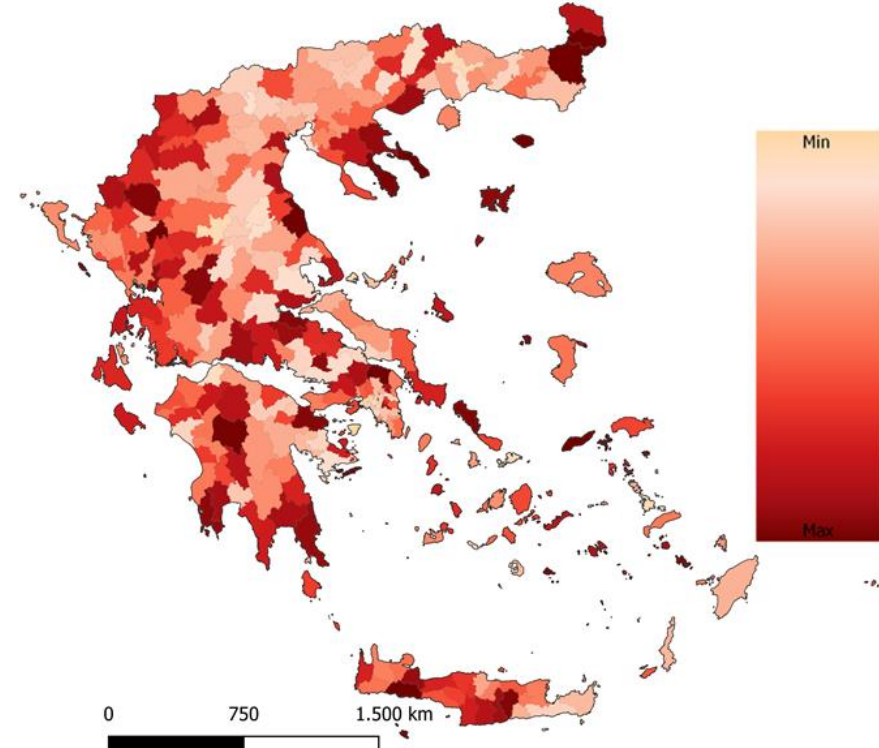
	Min.	Mean	Max.	Std. Dev.	Skewness	Kurtosis
Current Costs per capita before	105.97	<b>774.30</b>	5,943.80	653.70	4.19	24.55
Current Costs per capita after	249.91	<b>845.40</b>	11,326.27	813.24	7.88	89.29

# Average Investments before and after the amalgamation process

Average Investments per capita before the amalgamation (2005-2009)



Average Investments per capita after the amalgamation (2011-2018)



	Min.	Mean	Max.	Std. Dev.	Skewness	Kurtosis
Investments per capita before	16.87	<b>449,25</b>	3,969.18	520.21	3.10	12.38
Investments per capita after	19.50	<b>448.10</b>	5,740.95	585.78	4.89	33.42



# Demographic and socioeconomic data

## Municipal (LAU1) level

- Population
- Working age population
- Total number of births
- Total number of deaths
- People in/not in the labor force (% 15-74)
- Employed/Unemployed people (% in the labor force)
- Young employed persons (% employment and % pop\_15\_24)
- Transfers (Revenues from grants)
- Transfers (Grants to cover operating costs)
- Transfers (Grants for investments)

Also, **GDP per capita** at NUTS 2 and NUTS3 level



# Satellite imagery to proxy socioeconomic variables (LAU1)

## Data source

- Harmonized yearly dataset produced by Li, Zhou, Zhao, & Zhao (2020) using the DMSP/VIIRS night-time satellite images

## Target

- Nighttime light activity to proxy GDP per capita

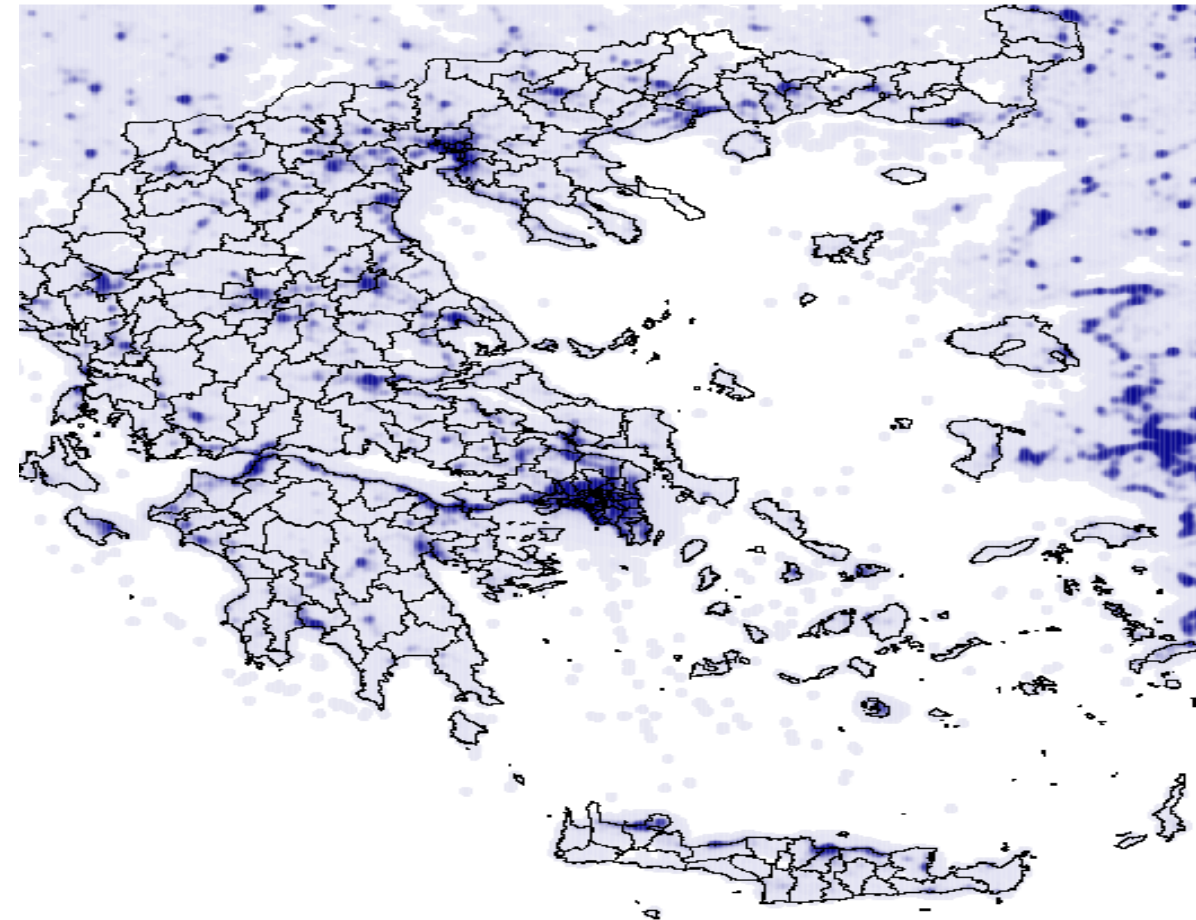
## Methodology

- Fixed effect model with year and regional (NUTS II) fixed effects and clustered standard errors at regional level (Henderson et al., 2012).

## Final Indicator

- GDP per capita at LAU1 level

Nighttime Lights Greece (2018)



# Empirical Strategy



# Basic model

$$Y_{it} = \mu_i + \tau_t + \gamma Amalgamation_{it} + \beta x_{it} + \epsilon_{it}$$

- $Y_{it}$ : log of the per capita expenditure (current costs *or* investments)
- $\mu_i$ : municipal fixed effects
- $\tau_t$ : year fixed effects
- *Amalgamation*: dummy variable - one if the municipality has been amalgamated and zero otherwise
- $x_{it}$ : control variables
- $\epsilon_{it}$ : error term clustered at the municipal level

## Differential growth paths for Greek regions?

- Region (NUTS II)-by-year fixed effects





# Propensity matching score

## □ Why?

- Amalgamated municipalities **might be different than non-amalgamated**. Thus, bias.

## □ How?

- **Non-amalgamated with same pre-treatment characteristics** to amalgamated (propensity score (PS) of being amalgamated) using a logit regression model.
  - Dependent variable: dummy (1 amalgamated, 0 otherwise)
  - Independent variable: population, per-capita surface, working age population, labor force participation rate, unemployment rate, youth unemployment rate, GDP per-capita (all in NUTS III level)
- **Re-estimate** basic model using information only on the observations that lie on the common support (Sianesi, 2004; Smith & Todd, 2005)



# The common trend assumption

$$Y_{it} = \mu_i + \tau_t + \sum_{\pi=2}^5 \gamma_{\pi} Amalgamation_{i,\pi} + \sum_{\tau=0}^7 \gamma_{\tau} Amalgamation_{i,\tau} + \beta x_{it} + \epsilon_{it}$$

## □ Why?

- Same trends of amalgamated and non-amalgamated municipalities in the absence of the amalgamation. If the trends are the same, the interactions not statistically significant (Autor, 2003)

## □ How?

- Interactions of time dummies and the exposure indicator for pre-treatment periods



# Robustness checks - Placebo test

## □ Why?

- What if amalgamated municipalities had already a different path of expenditure even before the amalgamation?

## □ How?

- Assume that the amalgamation occurred 1, 2 and 3 year(s) earlier than the true data and replicate the analysis.



# Robustness check - Outliers

## □ Why?

- What if extreme values affect the results?

## □ How?

- Trimming values (1% - 5%)



# Heterogeneous effects-Permanence

$$Y_{it} = \mu_i + \tau_t + Amalgamation_{it} \times (\gamma + \delta permanence_t + \lambda permanence_t^2) + \beta x_{it} + \epsilon_{it}$$

## □ Why?

- What if there has been a heterogeneous response according to the time since the amalgamation occurred?

## □ How?

- Create a continuous variable, permanence
  - measures the time since the amalgamation took place (1 to 8 years).
- Create quadratic term ( $permanence^2$ ), allowing the effect to be a non-linear function of time.



# Results



# Baseline results - Current Costs

Dep. Variables	Current costs				Current costs matching			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Amalgamation</b>	0.056	0.030	-0.024	<b>-0.101**</b>	<b>0.116*</b>	0.071	0.006	<b>-0.123**</b>
	(0.048)	(0.042)	(0.052)	<b>(0.042)</b>	<b>(0.067)</b>	(0.057)	(0.057)	<b>(0.057)</b>
<b>Observations</b>	4,136	4,136	4,136	<b>3,982</b>	<b>3,070</b>	3,070	3,070	<b>2,961</b>
<b>R-squared</b>	0.797	0.805	0.818	<b>0.853</b>	<b>0.780</b>	0.790	0.805	<b>0.844</b>
<b>Controls</b>	No	Yes	Yes	<b>Yes</b>	<b>No</b>	Yes	Yes	<b>Yes</b>
<b>Transfers</b>	No	No	No	<b>Yes</b>	<b>No</b>	No	No	<b>Yes</b>
<b>Municipal FE</b>	Yes	Yes	Yes	<b>Yes</b>	<b>Yes</b>	Yes	Yes	<b>Yes</b>
<b>Year FE</b>	Yes	Yes	Yes	<b>Yes</b>	<b>Yes</b>	Yes	Yes	<b>Yes</b>
<b>Region * year FE</b>	No	No	Yes	<b>Yes</b>	<b>No</b>	No	Yes	<b>Yes</b>



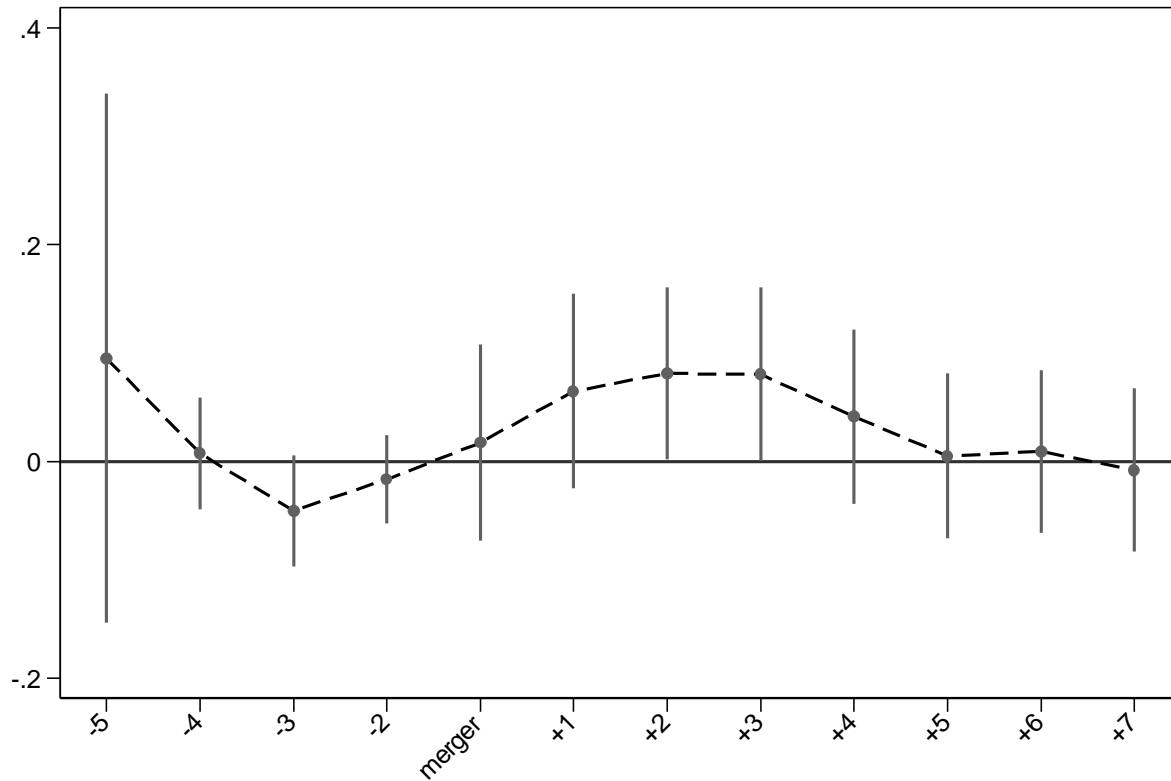
# Baseline results - Investments

Dep. Variables	Investments				Investments matching			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Amalgamation</b>	-0.128	<b>-0.168*</b>	-0.112	<b>-0.206**</b>	-0.125	-0.175	<b>-0.220*</b>	<b>-0.307***</b>
	(0.095)	<b>(0.094)</b>	(0.102)	<b>(0.097)</b>	(0.122)	(0.121)	<b>(0.120)</b>	<b>(0.099)</b>
<b>Observations</b>	3,834	<b>3,834</b>	3,834	<b>3,832</b>	2,837	2,837	<b>2,837</b>	<b>2,836</b>
<b>R-squared</b>	0.779	<b>0.782</b>	0.797	<b>0.836</b>	0.772	0.774	<b>0.790</b>	<b>0.840</b>
<b>Controls</b>	No	<b>Yes</b>	Yes	<b>Yes</b>	No	Yes	<b>Yes</b>	<b>Yes</b>
<b>Transfers</b>	No	<b>No</b>	No	<b>Yes</b>	No	No	<b>No</b>	<b>Yes</b>
<b>Municipal FE</b>	Yes	<b>Yes</b>	Yes	<b>Yes</b>	Yes	Yes	<b>Yes</b>	<b>Yes</b>
<b>Year FE</b>	Yes	<b>Yes</b>	Yes	<b>Yes</b>	Yes	Yes	<b>Yes</b>	<b>Yes</b>
<b>Region * year FE</b>	No	<b>No</b>	Yes	<b>Yes</b>	No	No	<b>Yes</b>	<b>Yes</b>

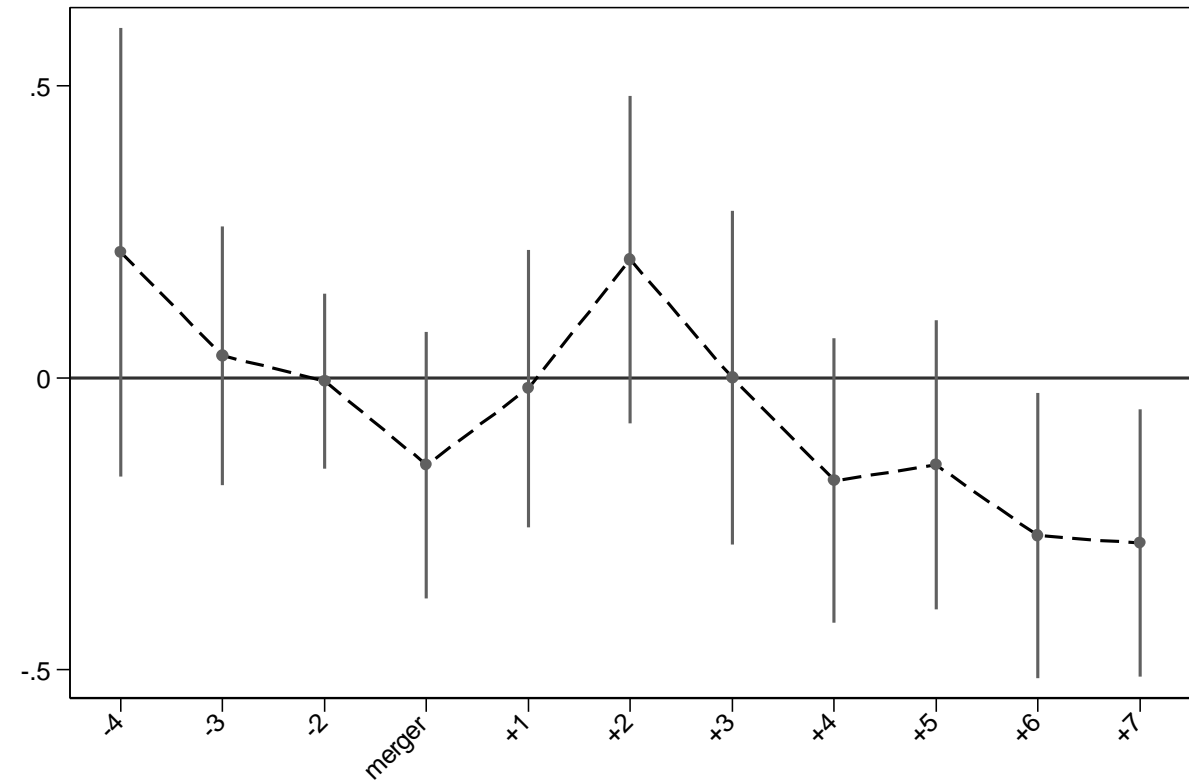




# The common trend assumption



Time passage relative to years of the merger



Time passage relative to years of the merger



# The common trend assumption

- Current Costs (i) Pre-amalgamated: No difference. (ii) Post-amalgamated: higher 2 and 3 years after
- Investments (i) Pre-amalgamated : No difference. (ii) Post-amalgamated period: significant reduction after 6 and 7 years
- Overall, no evidence against the presence of a common trend between treated and control units



# Robustness check - Placebo test

Dep. Variables	Current costs			Investments		
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Amalgamation fake 2007</b>	-0.065			-0.203		
	(0.059)			(0.188)		
<b>Amalgamation fake 2008</b>		-0.021			-0.128	
		(0.041)			(0.105)	
<b>Amalgamation fake 2009</b>			-0.005			-0.083
			(0.035)			(0.095)
<b>Observations</b>	1,551	1,551	1,551	1,251	1,251	1,251
<b>R-squared</b>	0.761	0.760	0.760	0.733	0.733	0.732
<b>Controls</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Municipal FE</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Year FE</b>	Yes	Yes	Yes	Yes	Yes	Yes



# Robustness check - Outliers

Panel A: Current Costs

	Trimming 1%				Trimming 5%			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Amalgamation	<b>0.081*</b> <b>(0.042)</b>	0.059*	0.032	-0.032	0.041	0.040	0.026	-0.028
Observations	4,054	4,054	4,054	3,906	3,722	3,722	3,722	3,595
R-squared	0.852	0.865	0.872	0.893	0.834	0.847	0.856	0.884
Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Transfers	No	No	No	Yes	No	No	No	Yes
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * year FE	No	No	Yes	Yes	No	No	Yes	Yes

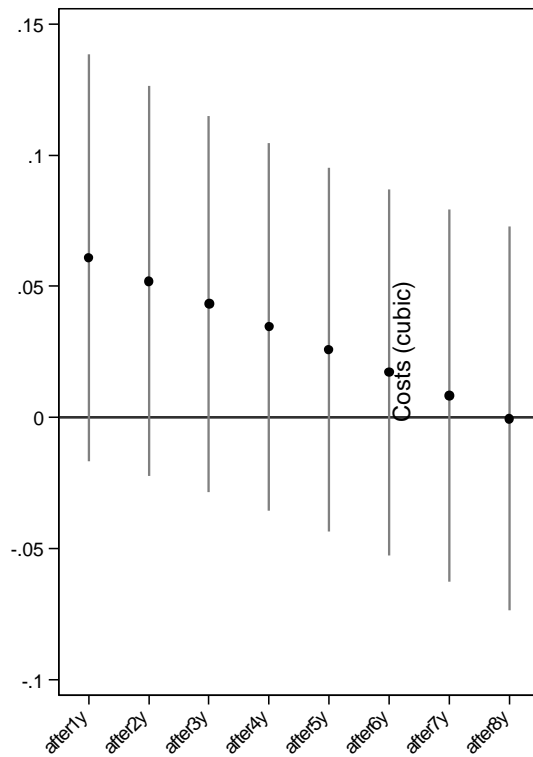
Panel B: Investments

	Trimming 1%				Trimming 5%			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Amalgamation	<b>-0.157*</b> <b>(0.086)</b>	<b>-0.204**</b> <b>(0.085)</b>	<b>-0.152*</b> <b>(0.092)</b>	<b>-0.233***</b> <b>(0.082)</b>	<b>-0.262***</b> <b>(0.076)</b>	<b>-0.289***</b> <b>(0.076)</b>	<b>-0.251***</b> <b>(0.086)</b>	<b>-0.297***</b> <b>(0.074)</b>
Observations	3,758	3,758	3,758	3,756	3,451	3,451	3,451	3,449
R-squared	0.793	0.795	0.811	0.855	0.772	0.775	0.798	0.844
Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Transfers	No	No	No	Yes	No	No	No	Yes
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * year FE	No	No	Yes	Yes	No	No	Yes	Yes

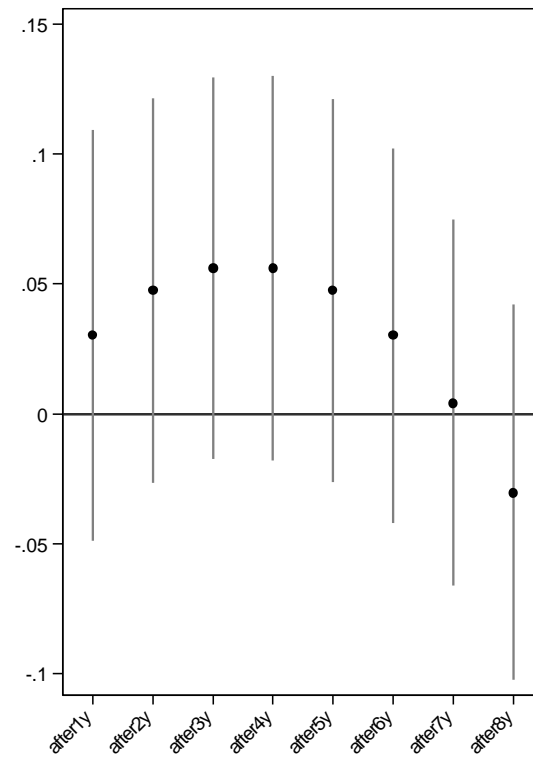


# Heterogeneous effects-Permanence

## Current Costs

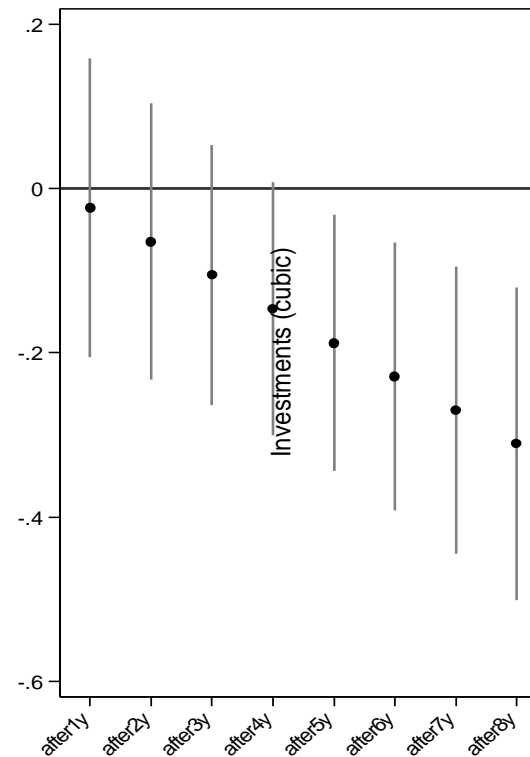


Years after the merger

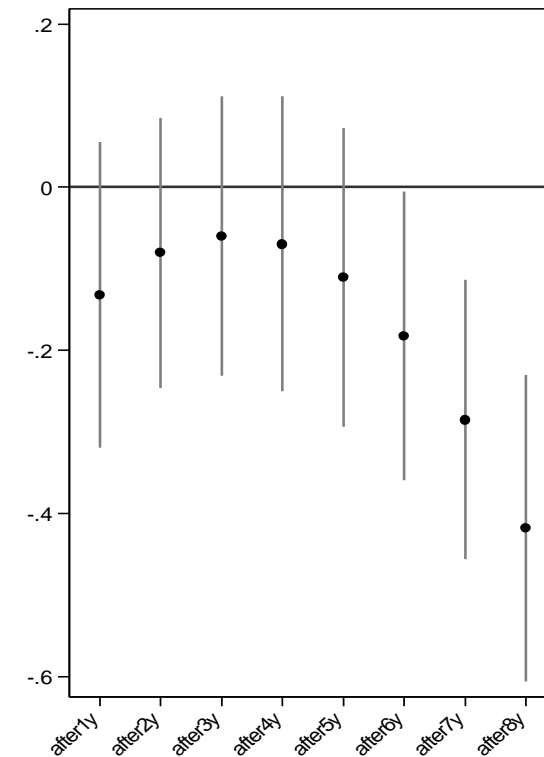


Years after the merger

## Investments



Years after the merger



Years after the merger



# Heterogeneous effects – Current costs specific items

## □ Specific Items

- Personnel costs: staff fees and expenses and the remuneration of elected and third parties cost categories.
- Financial costs: taxes-fees, payments for public credit service and other expenses.
- Third parties' costs: third party benefits and payments - transfers to third parties.
- Other costs: other overheads and expenditure on the supply of consumables.

## □ Results

- The **(weak) increase** in current costs observed in amalgamated municipalities might be driven by **an increase of financial expenses**

Specific items: Current costs				
Dep. Variables	Personnel costs	Financial costs	Third parties' costs	Other costs
<b>Amalgamation</b>	0.009	0.098	0.029	<b>-0.127*</b>
	(0.031)	(0.149)	(0.074)	<b>(0.070)</b>
<b>Observations</b>	4,137	4,044	3,817	3,817
<b>R-squared</b>	0.839	0.651	0.700	0.825
<b>Controls</b>	Yes	Yes	Yes	Yes
<b>Municipal FE</b>	Yes	Yes	Yes	Yes
<b>Year FE</b>	Yes	Yes	Yes	Yes



# Heterogeneous effects – Investments specific items

## Specific Items

- (i) purchases of buildings, technical works and supplies of fixed assets (10% of total investments)
- (ii) projects (corresponding to approximately 80%)
- (iii) studies, research, experimental work and specific costs (8% of total investments)
- (iv) Fixed investment titles (business holdings)

## Results

- purchases of buildings and technical works yield **significant and negative effects**

	Specific items: investments			
Dep. Variables	Purchases of buildings, technical works and supplies of fixed assets	Projects	Studies, research, experimental work and specific costs	Fixed investment titles (business holdings)
Amalgamation	<b>-0.636***</b> <b>(0.140)</b>	-0.013 (0.125)	-0.062 (0.131)	0.573 (0.354)
Observations	3,499	3,504	3,443	1,670
R-squared	0.606	0.710	0.639	0.529
Controls	Yes	Yes	Yes	Yes
Municipal FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes



# Output - GDP based on luminosity

## □ Why?

- Verify whether the reduction of expenditure after the amalgamation process led to a decrease in local economic conditions

## □ How?

- Nighttime light activity to proxy GDP per capita at the municipal level

## □ Results

- statistically **significant decrease in local GDP.**
- evidence that the **reduction in investment** has been achieved by **significantly deteriorating local economic conditions**

Dep. Variables	GDP based on luminosity			GDP based on luminosity matching sample		
Amalgamation	<b>-0.640***</b>	<b>-0.287***</b>	<b>-0.586***</b>	<b>-0.376***</b>	<b>-0.117***</b>	<b>-0.135***</b>
	<b>(0.111)</b>	<b>(0.057)</b>	<b>(0.154)</b>	<b>(0.081)</b>	<b>(0.025)</b>	<b>(0.045)</b>
Observations	3,938	3,938	3,938	2,919	2,919	2,919
R-squared	0.782	0.929	0.934	0.611	0.978	0.979
Controls	No	Yes	Yes	No	Yes	Yes
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region * year FE	No	No	Yes	No	No	Yes





# Conclusions

We investigated the **municipal amalgamation in Greece** to identify the **impact of the amalgamation** process on current costs and investments.

We extensively **examined this reform for the first time** relying on a unique dataset on and we used remote sensing and satellite imagery of local night-time lights to proxy economic activity at municipal level

We found **significant effects on current costs** only when we control for region-by-year fixed effects as well as vertical transfers and negative and robust effect of amalgamation on investment from 11 to 20%.

Future steps: Whether the **political alignment of local governments with the central government** has an effect of municipal revenues and expenditures.



# Thank you



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# Questions?



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